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# **SNPP ATMS Study Of Mitigations To Extend On-Orbit Life Scan Drive Working Group Status**

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# Agenda



- **Introduction**
- **Scan Drive Subsystem Operational Modes**
- **Live Extension Considerations**
- **Alternate Scan Profile**
- **Impact & Other Analysis Needed**
- **Summary**

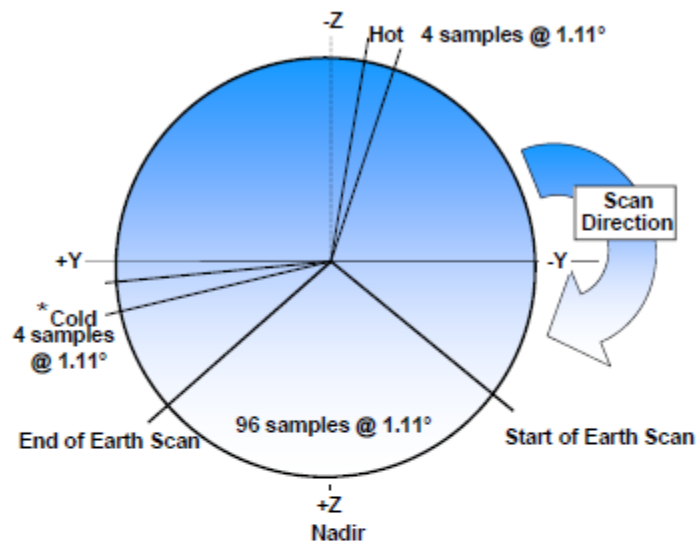


# Introduction

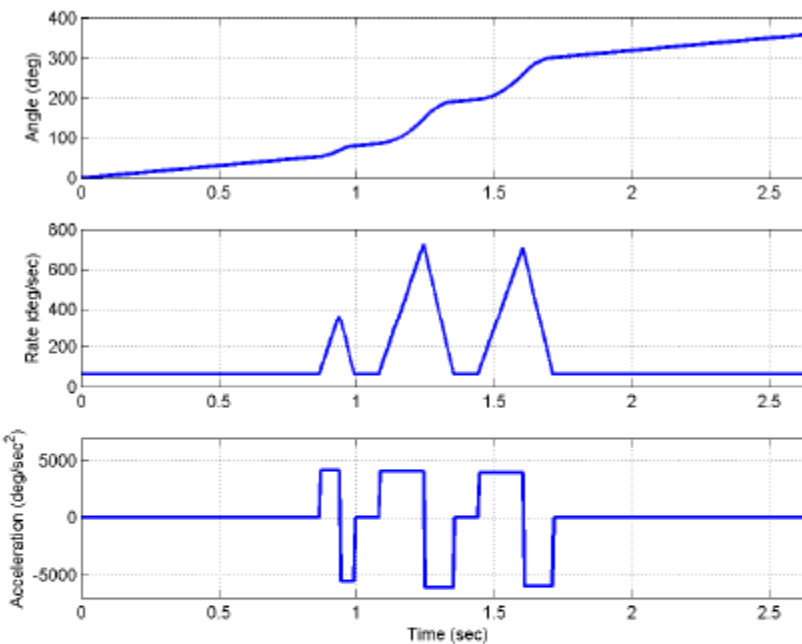
- **SNPP mission life is 5 years (instrument design life is 7-years)**
  - Oct. 2016 = 5ys on-orbit
- **SNPP ATMS performance on-orbit to date**
  - ATMS has had no anomalies since launch on October 28, 2011
  - All performance parameters have been and continue to be within specification
  - SNPP ATMS is expected to meet or exceed the mission 5-year life
- **NOAA is concerned about a potential gap in polar orbit data**
  - Inspector General, Government Accounting Office, and Independent Review Team reports have substantiated NOAA's concerns regarding the gap.
  - Follow on satellite launch delays could produce a data gap
- **Mitigation of data gaps between SNPP and JPSS-1 is highly desired**
  - Early engineering assessment identified the Scan Drive Mechanism as an area worthy of consideration for life extension
    - Hypothesis: Reduce scan rotational acceleration forces while minimizing performance and ground operation impacts to increase bearing life
    - Status since CALCON: "Path forward is to pursue engineering and scientific review this fall prior to final recommendation to the Program late this year"



# Scan Drive Subsystem Operational Modes



\*Primary cold cal sector at 6.66°, alternate sectors at 8.33°, 10.00° and 13.33°



- **Scan Mode**
  - Constant speed during data collection
    - Earth Scan
    - Cold & Hot calibration sectors
  - Accel / Decel profile between sectors
- **Stare Mode**
  - Go to defined position and stop

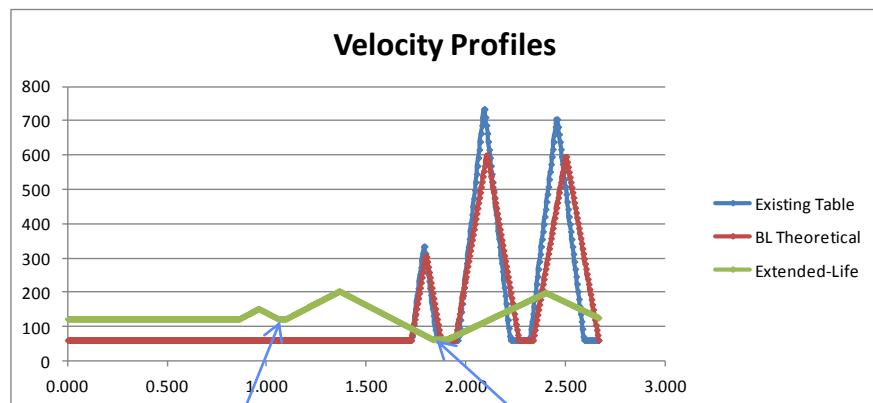


# Life Extension Considerations



- **The bearings in the Scan Drive Subsystem are the components most likely to limit life expectancy of the instrument**
- **The government and the contractor team (NGES) have analyzed several alternate scan profiles to reducing the wear on the bearings**
  - **Previous best option** – Alternate scan profile that retains the current 8/3 second scan but speeds up Earth view sector to reduce acceleration and deceleration during slew to scan start points
- **Analysis of life gained by alternate scan profile suggests another option**
  - Three factors affect ATMS bearing life
    - The rapid accelerating and decelerating of the scan drive profile
    - The temperature of the lubricant
    - The continuous scan direction versus change scan direction
  - Reversing scan periodically may be better option

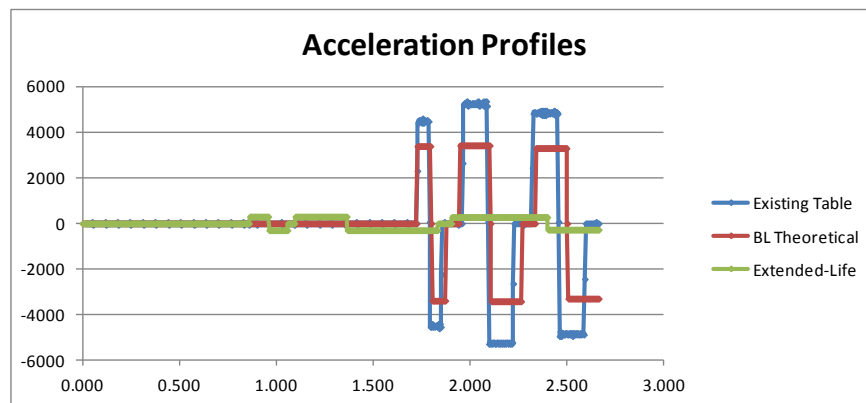
# Alternate Scan Profile



CC

HC

- *2X velocity during Earth view and Cold Cal sectors*
- *1X velocity during Hot Cal Sector*



Sector:	Earth View	Cold Cal	Hot Cal
Sample No:	1-48	60-61	103-106

- *Factor of 15x less acceleration than for the existing nominal profile*



# Impact & Other Analysis Needed



- **Impact of changing scan profile**
  - NEDT has been analyzed (STAR): 40% increase in noise
- **Other Analysis Needed**
  - Analysis of life gained by alternate scan profile (discussed earlier)
    - Expect report in January 2014
    - Preliminary results are encouraging
      - Better understanding of bearing wear components
        - Temperature, scan profile, scan direction
  - Risk analysis
    - In turning off ATMS on SNPP until needed (no one liked this option)
    - In putting ATMS in a SAFEHOLD mode until needed (~4 years)
    - Any other proposed change to operations
  - Impact of changing scan profile to weather prediction
  - Impact of changing scan profile to NASA science requirements
  - Impact of changing scan profile to ground and spacecraft
    - This analysis is on hold until life gained by alt scan profile is complete



# Summary



- **SNPP ATMS performance on-orbit to date has been very good and has been providing reliable data for weather prediction since its launch on October 28, 2011**
  - All performance parameters have been and continue to be well within specification
  - SNPP ATMS is expected to meet or exceed its 5-year mission life
- **Extending operational life significantly beyond the 5-year mission life will fill the potential data gap should there be a delay in the follow-on satellite**
- **The most viable alternate operations scenarios identified will be demonstrated on the Engineering Development Unit**
- **Path forward is to finish engineering and scientific review prior to final recommendation to the Program around early 2014**